

## **School of Materials Science and Engineering**

### **Master Program in Materials Science and Engineering**

First-level discipline name (Code): Materials Science and Engineering (0805)

#### **1. Introduction**

The discipline was established in 2004 with a major in Inorganic Non-metallic Materials Engineering. In 2011, it was granted the right to confer master's degrees in the first-level discipline. Currently, it is supported by four undergraduate majors: Inorganic Non-metallic Materials Engineering (2004), Materials Chemistry (2007), Functional Materials (2011), and New Energy Materials and Devices (2021). Through development, the discipline was selected for Jiangsu Province's first-phase, second-phase advantageous discipline construction projects in 2011, 2016, and 2021, as well as the key discipline construction project of Jiangsu Province.

The discipline covers two research directions: Materials Science and Materials Physics and Chemistry. With the support of research platforms such as the "Jiangsu Provincial Key Laboratory of Environmental Functional Materials," "Jiangsu Provincial Engineering Laboratory for Biochemical Sensing and Chip Technology," and others, it has a comprehensive training center for new materials and is one of the well-equipped physical and chemical testing centers in the Suzhou area. Additionally, it has research and testing platforms for electrocatalysis, secondary batteries, fuel cells, supercapacitors, solar cells, photocatalytic systems, and biochemical sensing. It has distinct characteristics in research areas such as energy storage and conversion materials, nano-biofunctional materials, environmental functional materials, and green printing and optoelectronic information materials, all aligned with national strategic needs in low-carbon and new energy, life and health, ecological environment, and information technology.

The discipline currently has 61 teachers, including 15 professors (6 doctoral supervisors) and 22 associate professors, all with doctoral degrees. The faculty includes 1 academician of the Chinese Academy of Sciences, 1 foreign academician of the European Academy of Sciences and the Russian Academy of Engineering, 2 overseas high-level talents, 1 expert enjoying special government allowances from the State Council, and other provincial-level talents. The faculty has also undertaken various leadership roles in academic organizations and has contributed significantly to international academic journals.

In recent years, the discipline has undertaken 2 projects under the Ministry of Science and Technology's "973" Program, over 30 projects under the National Natural Science Foundation of China, and numerous other national and provincial research projects, with research funding

reaching nearly 100 million yuan. It has published over 1500 papers in core journals, including 1000+ SCI-indexed papers in leading international journals such as Nature Energy, Nature Communications, Journal of the American Chemical Society, and Advanced Materials, with total citations exceeding 30,000. Additionally, it has been granted over 270 national invention patents and has received multiple provincial and ministerial-level awards for scientific and technological progress, technical inventions, and teaching achievements.

## **2. Training objectives**

The Master of Materials Science and Engineering is a professional degree related to the qualification of materials engineering, aiming to cultivate applied and compound high-level engineering technology and engineering management talents in various countries. The specific requirements are as follows:

1. Basic knowledge training objectives: systematically master the basic theoretical knowledge and professional knowledge of this discipline, including understanding and recognizing the basic situation of China, learning and mastering the basic knowledge of Chinese, the basic theoretical knowledge of this major, and other related theoretical knowledge of other disciplines.

2. Basic quality training objectives: have a high scientific literacy and good academic style; have a sense of historical mission and social responsibility to dedicate to science and serve society; possess a spirit of seeking truth from facts; establish a concept of the rule of law, protect intellectual property rights, and respect the research results of others.

3. Basic ability training objectives: possess the ability to acquire knowledge, including good information retrieval ability, academic communication ability, and self-learning ability; have the ability to judge the research methods, research process, and scientific value of research results in the field of materials science and engineering; have good scientific research ability, and be able to objectively analyze problems and solve engineering practice problems using scientific methods; possess foreign language ability and computer skills.

## **3. Research Directions**

### **01 Materials Science**

#### **1. Environmental Functional Materials**

Aiming at the research and development of key materials and technologies in the green and environmentally friendly field, conducting in-depth and systematic research on functional new materials, new processes, and new equipment related to environmental detection/monitoring, efficient enrichment, and purification water treatment technology. This aims to achieve effective control of environmental pollution and efficient utilization of resources related to

"three wastes," as well as the development of new semiconductor materials and their device applications.

## **2. Green Printing and Upconversion Luminescent Materials**

In response to the demand of the flexible device industry chain, focusing on the development challenges of core ink materials such as green, low-cost, high responsiveness, and high stability, expanding research on triplet-state exciton migration luminescent materials, green printing materials, photonic crystal coating materials, and printing electronic pastes, as well as supporting green printing technology. Exploring new mechanisms for anti-Stokes luminescence and conducting original research from "two photons" to "single photon" weak light upconversion. Additionally, addressing the bottleneck problems faced in the field of large-size, high-quality substrate material preparation, micro-nano processing, low power consumption, high-speed, and multifunctional integrated storage chips in the semiconductor materials and chip field, to support the upgrading and replacement of the optoelectronic information engineering industry chain and wearable flexible devices.

## **02 Materials Physics and Chemistry**

### **1. Energy Storage and Conversion Materials**

Developing key materials, technologies, and devices for new energy, researching and developing high-rate, large-capacity, long-cycle, and high-safety power battery materials and technologies to achieve the development of high-performance power batteries. Additionally, developing efficient photocatalytic and electrocatalytic materials and technologies, and researching high-performance solar cells.

### **2. Nano-bio Functional Materials**

Researching and developing new bio-sensing materials, developing standardized integration technology for biochips, conducting bio-refining and biocatalysis, preparing high-value products such as non-natural sugars for antiviral drug intermediates, steroid hormone drug intermediates, and conducting biological information prediction and screening of natural active ingredients combined with cell metabolism.

## **4. Years of Study**

1. The duration of master study is 3 years. The maximum length of study from entry to graduation is 4 years.

2. Excellent graduate students who have completed the training plan in advance can apply for the defense in advance, but the advance time is not more than one year; The thesis proposal of the graduation (degree) thesis that applies for defense in advance should also be carried out in advance, and the application should be submitted 2 weeks before the thesis proposal, with

the consent of the supervisor, the school and the graduate department, and the relevant procedures shall be carried out.

3. Students who fail to complete the training plan within the prescribed schooling period can extend their learning time by 1 year upon the approval of the university. Applicants should apply for the extension of study time 2 weeks before the end of the last semester of the normal schooling period (or the extension of study time), with the consent of the supervisor, school and graduate department, go through relevant procedures, and pay the relevant fees according to the current year standard. The period of suspension is counted as the length of schooling.

## **5. Cultivating method**

The training pattern implements a tutorial system, each student will be assigned a tutor/supervisor based on mutual agreement. We also encourage training patterns such as research team based talent developing mode, inter-universities or joint training by university, research institute and industry, as well as internarial joint training pattern if feasible. Each student's talent and skills will be fully taken into account during the training process, including teaching design and implementation.

## **6. Credits requirements**

Credit system is adopted for master courses. The basic requirements of master credits: the total credits are no less than 32 credits and no more than 36 credits. No less than 20 credits must be completed before the mid-term assessment; Before applying for dissertation defense, all the contents of personal training plan must be completed and conform to the provisions of program plan.

## **7. Courses setting and requirements**

### **7.1 Courses setting**

**Course Setting Table**

Category	Course Code	Courses Name	Credit hours	Credit	Semester			Assessment	Remarks
					1	2	3		
Degree course	General courses	1001	Chinese Language (I)	32	2	√			General course (8 credit points)
		1002	Chinese Language (II)	32	2		√		
		1003	Introduction to China	32	2	√			
		1004	Probability Theory and Mathematical Statistics	32	2		√		
	Foundational courses	2001	Modern Methods of Materials Analysis	32	2	√			Discipline foundation courses (10 credit points)
		2002	Fundamentals of Materials Science	32	2	√			
		2003	Writing of Scientific Paper	32	2	√			
		2004	Synthesis and Preparation of Materials	32	2	√			
		2005	Catalytic Science and Engineering	32	2	√			
		2006	Physical Chemistry	32	2	√			
	Optional course	3001	Semiconductor Electrocatalysis	32	2		√		Optional course (14 credit points should be completed)
		3002	Biochemical Sensing Materials and Techniques	32	2		√		
		3003	Organic Optoelectronic Materials and Device	32	2		√		
		3004	Computational Materials Science	32	2		√		
		3005	New Electrochemical Energy Materials	32	2		√		
		3006	Inorganic Photoelectronic Materials and Technology	32	2		√		
3007		Green Energy Engineering and Technology	32	2		√			
3008		Low-dimensional Nanomaterials & Characterization	32	2		√			
3009	Surface and Interface of Material	32	2		√				
3010	Advanced therapeutic and diagnostics materials for clinical application	32	2		√				
3011	Introduction of Renewable Energy	32	2	√					
3012	Fundamentals and Applications of Electrochemiluminescence	32	2	√					

### 7.2 Courses Requirements

Degree courses must have a score of 70 or above and non-degree courses must have a score of 60 or above

### 7.3 Education Arrangement

In principle, all courses should be completed within 1 year

## 8. Requirements for academic achievements

Before the dissertation defense, graduate students are encouraged to publish an academic paper in the field of their major as the first author in an English professional journal (the original of the offer notice is also acceptable), and submit the original of the paper or the original of the offer notice and certification materials to the school. At the same time, the academic achievements should meet the requirements "Rules of publication of academic papers for graduate students of Suzhou University of Science and Technology"

## **9. Dissertation requirements**

Dissertation is an important part of the master program, including topic selection, proposal report, writing, mid-term evaluation, pre-defense, review and defense, etc. Each stage will be undertaken according to the relevant rules and policies of our university, including "Rules of Master's degree for topic selection and proposal report (trial)", "Rules of Master's degree dissertation mid-term evaluation (trial)", "Rules of Master's degree dissertation Pre-defense (trial)" and "Rules of Master's degree defense of dissertation" and some other relevant provisions.

The dissertation should be carried out under the guidance of the supervisor. The dissertation should be selected in close combination with the frontier issues in the research field, which should have certain practical application value and academic theoretical significance, and be carried out by the graduate students themselves. The dissertation must meet the required workload and the relevant topic selection requirements. The time required for research should not be less than 1 year. The dissertation must be written in accordance with the "Basic Format and Relevant Requirements of The Master's Dissertation of Suzhou University of Science and Technology".

The dissertation defense of master's degree shall be conducted in accordance with "Rules of Academic Degree Regulations of the People's Republic of China" and "Detailed rules of Master degree Awarding of Suzhou University of Science and Technology".